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Ectoparasites of Coral Reef Fishes and Their Value as Biological Indicators of Pollution

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1. Introduction

There is little available information on ectoparasites of coral-reef fishes in the Australian and Indo-Pacific regions. Rohde (1976, 1977) estimated that there were 20,000 species of parasites on 100 fish species at the southern end of the Great Barrier Reef, but few of them have been described. Similarly, Bruce (1986) commented that little is known about either endemicity or patterns of distribution of parasitic isopods in the Indo-Pacific. The copepod ectoparasites from this region are equally unknown. A single species of parasite isopod *Anilocra amboinensis* has been described from the coastal waters of Ambon (Bruce, 1988). Evans et al. (1955) related the incidence of the isopod *Renocila* sp. on its host, the Sergeant Major fish *Abudefduf saxatilis,* to pollution stress in Ambon. Otherwise, there appears to be no information.

The object of the present study was to describe isopod and copepod parasites on a range of coral fishes caught in coastal waters of Ambon. In addition, the opportunity was taken to relate the degree of parasitism to assessments of organic pollution in adjacent waters.

2. Methods

Fish belonging to 68 different taxa were examined for ectoparasites. There were between 1 and 63 individuals of each taxon. These fish were obtained in three ways: (a) by spear-fishing; (b) by gill-netting in shallow coastal waters; or (c) by purchasing uncleaned fish from fish markets. Fish were examined individually for parasites, over the whole body surface, inside the mouth, and on the gill bars. Parasites were removed

from their hosts and preserved in 10% formalin in seawater. Subsequently, 8 species of isopods were identified with the assistance of Dr. N. Bruce of the University of Copenhagen, and 6 species of copepods with the help of Dr. G. Boxshall of the British Museum of Natural History.

In order to relate the incidence of parasitism to pollution stress, assessments were made of organic pollution at 12 sites from which fish had been obtained by spear-fishing or gill-netting. These were done by scuba-diving at each site. A three-point scale was used: 1 = clean site; 2 = moderately polluted; 3 = heavily polluted. The sites (named after nearby villages) and pollution assessments were as follows: Asilulu (1), Batu Merah (3), Mamala (3), Hative Besar (2), Lateri (3), Namalatu (2), Natsepa (2), Pulau Tiga (1), Tial (2), Toisapu (1), Tanjung Alang (1), and Tulehu (1).

Table 1. Parasitic isopod and copepod species from coral reef fish hosts.

PARASITE	HOST
ISOPODS	
Anilocra (aff. apogognae Bruce, 1987)	*Apogon* sp.
Anilocra koolanae Bruce, 1987	*Pterocaesio tile*
Ceratothoa sp.	*Decapterus* sp.
Cerathothoa usuacarangis (Audeer, 1970)	*Myripristis adusta*
Cterissa ptyerygota Koelbel, 1878	*Myripristis vitata*
Elthusa sp. Bruce	*Apogon* sp.
Gnathia sp. praniza larvae	various hosts
Norileca indica Milne-Edwards, 1840	*Decapterus* sp.
Renicola sp. Williams and Williams, 1992	*Abudefduf saxatilis*
COPEPODS	
Abasia inflata Cressey and Cressey, 1979	blenny indet.
Hatschekia insolata Wilson, 1913	*Epinephelus merra*
Hatschekia nahansis Yamaguti, 1953	*Abudefduf saxatilis*
Hatschekia quadrabnominalis Yu, 1933	*Priacanthus blochii*
Neobrachiella lutiani Pillai, 1985	*Cephaopholis alliomarginata*
Sagum lativentris Heller, 1868	*Mesoprion phaitaeniatus*

3. Results

Of the 68 host taxa that were examined for parasites, 51 taxa (75.0%) were infected with copepods, 6 (8.8%) with adult isopods, 10 (14.7%)

carried praniza larva of the isopod *Gnathia* sp., and 17 (25.0%) were uninfected.

Eight species of adult isopod were recorded (Table 1). Each isopod species was recorded on a single host taxon but the fish species, *Apogon* sp. and *Decapterus* sp. were each hosts to two species of parasites. Apart from *Norileca indica* and *Cerathocera* sp., which were found in the mouth of the hosts, the remaining six isopod parasites were attached to the outer body surfaces of fish. Larvae of the isopods *Gnathia* and adult copepods were recorded on the gill bars of the hosts only. Six species of copepods were identified (Table 1).

Copepod burdens were heavier in more severely polluted sites than in less heavily polluted ones (Table 2). Seven species of host fish were collected from sites of two different pollution ratings. In the six cases (one tied score), the numbers of individuals that carried parasites were more at the more polluted site than at the less polluted site. This difference is significant ($T^+ = 21$; $n=6$; $p<0.05$; Wilcoxon Matched Pair Test).

Table 2. Percentage numbers of hosts infected with copepod parasites at sites of different pollution ratings (see Methods).

HOST	POLLUTION RATING					
	1		2		3	
	n	%	n	%	n	%
Abudefduf saxatilis	1	0	26	42	–	–
Abudefduf vaigiensis	–	–	4	0	2	100
Decapterus sp.	1	0	–	-	4	100
Myripristis kunte	–	–	2	100	1	100
Myripristis vitata	–	–	11	73	12	100
Phemphesis ovalensis	–	–	6	16	10	100
Priacanthus sp.	11	27	5	100	–	–
Mean (±SE)		9.0±9.0		55.0±17.4		100±0

4. Discussion

Each of the six isopod parasites described in this study was recorded on one host only. Although it might therefore appear that they are host-specific, this may not be the case for all of them. For example, the isopod *Anilocra koolanae* was recorded in the Blue Dash Fusilier *Pterocesio tile* in this study, but also on *Selaroides* sp. by Retraubun et al. (1998). In

addition, Bruce (1988) described it from fish collected from Kepulauan Seribu in the Java Sea. Although the specific hosts on which it occurred are not mentioned, they did not include *P. tile* (Bruce, pers. comm.). Both praniza larvae of the isopod *Gnathia* sp. and adult copepods were recorded on a variety of hosts. However the six identified copepods were each recorded on one host only, and they too may be host-specific. The finding that copepod parasite burdens were heavier in fish caught at more polluted sites than at less polluted ones accords with results of previous studies by Evans et al. (1995). They described the correlation between infections of the isopods *Renocila* sp. on the Sergeant Major fish *Abudefduf saxatilis*, and pollution from domestic waste at Ambon. It is likely therefore that ectoparasites of coral reef fishes will provide useful biological indicators of pollution stress in tropical waters, as internal helminth parasites have already done in temperate seas (Pascoe & Cram 1977, Boyce & Yamada 1977).

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